

Atty Docket No.: JCLA8676

Serial No.: 10/055,580

REMARKS**Present Status of the Application**

It is noted with great appreciation that the Office Action allowed claim 78. Further, Applicants would like to thank the Examiner for renumbering the claims 44-52 which were filed August 20, 2002 as claims 70-78.

Claims 36-43 and 70-84 remain pending of which claims 36 and 70 have been amended, claims 39, 40, 73 and 74 have been canceled, and new claims 79-84 have been added, to more explicitly and more clearly describe the claimed invention. It is believed that no new matter adds by way of these amendments made to the claims or specification or otherwise to the application. Support for amendments to claims can be found in page 11, lines 1-11. For at least the following reasons, Applicant respectfully submits that claims 36-38, 41-42, 70-72 and 75-84 are in proper condition for allowance. Reconsideration is respectfully requested.

Discussion of claim rejections

1. The Office Action rejected claims 36-40 and 70-74 under 35 U.S.C. 103(a) as being unpatentable over Dalal et al. (US-5,796,591, hereinafter Dalal) in combination with Takebe et al. (JP-358175839, hereinafter Takebe).

Applicants respectfully disagree and traverse the above rejections as follows. Independent claims 36 and 70, as amended, are allowable for at least the reason that both Dalal and Takebe fail to teach, suggest or disclose every features of the claimed invention. More

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specifically, both Dalal and Takebe fail to teach, suggest or disclose a cylindrical bonding structure on a silicon chip such that the structure may flip over and connect with a substrate....comprising: "a conductive cylinder on the bonding pad of the chip, wherein said conductive cylinder is comprised of an alloy lead and tin; and a cylindrical solder cap on the conductive cylinder, wherein said cylindrical solder cap is comprised of an alloy of lead and tin, as required by claims 36 and 70."

The advantage of making the conductive cylinder and the cylindrical solder cap using similar material, for example, alloy of tin and lead, is that this arrangement not only substantially eliminates an additional step of forming the solder cap on the junction pad but also both conductive cylinder and the conductive solder cap can be manufactured by a single manufacturing step through merely increasing content of the tin material when forming the conductive solder cap on the conductive cylinder. Thus the fabrication cost can be substantially reduced.

Instead, substantially Dalal teaches a structure and a method for making a package involving a chip joining a mother board comprising solder interconnection using solder balls having a cap of low melting point metal for allowing a low temperature chip attachment directly to any higher levels of packaging substrate, wherein the solder balls are comprised of lead, Bismuth, Indium, tin, or alloys thereof, and the solder cap is comprised of bismuth, indium, tin or alloys thereof (col. 8, lines 49-55). In other words, substantially Dalal failed to teach, suggest or disclose making both the solder balls and the solder caps using similar alloy material, and

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therefore it is clear that Dalal fails to teach, suggest or disclose the advantages of using the tin and lead alloy for making both the solder ball and the solder cap. Further, even though one skilled in the art modifies the solder balls of Dalal into a conductive cylinder in view of Takebe, still the combination of Dalal and Takebe cannot meet the claimed invention.

Further, because both conductive cylinder and the conductive solder cap are fabricated using the similar alloy material, expect for higher content of tin in conductive solder cap, therefore both conductive cylinder and the conductive solder cap can be integrally formed as a single element and therefore the bondability and thus the electrical connectivity can be ensured. In other words, the adhesion problems arising from using dissimilar materials for making solder balls/conductive cylinder and the solder cap as in the case of conventional art [Dalal and Takebe] can be effectively eliminated.

Because the present invention uses an alloy of tin and lead for fabricating both conductive cylinder and conductive solder cap, and therefore the internal stress generated between the conductive cylinder and the conductive solder cap is at a minimal level. The conductive cylinder of the present invention which is comprised of tin and lead alloy may not be as strong and hard as the conventional copper solder balls but it is sufficiently strong enough to provide adequate structural reliability. Further, since material used for manufacturing the conductive cylinder and the solder cap is PbSn alloy, and therefore it forms an eutectic structure which is more ductile (or tougher), to absorb stress to effectively reduce the internal stress. Furthermore, because the melting point of both conductive cylinder and the conductive solder cap have low melting point,

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therefore the elevated temperature can cure the internal stress and thus prevent from breaking. Accordingly the reliability of the device can be substantially improved.

For at least the forgoing reason, claims 36-38, 41-42 and 70-72 patently define over prior art of record. Reconsideration and withdrawal of these rejections is respectfully requested.

2. The Office Action rejected claims 41 and 75 under 35 U.S.C. 103(a) as being unpatentable over Dalal and Takebe as applied to claims 36 and 70 and further in combination of Yamai et al. (JP-409045691, hereinafter Yamai).

Applicants respectfully disagree and would like to point out that even though the Office Action relied upon Yamai to disclose a ball between the said bonding pad and a cylindrical conductive material, still Yamai cannot cure the specific deficiencies of Dalal and Takebe.

For at least the forgoing reason, claims 41 and 75 patently define over prior art of record. Reconsideration and withdrawal of these rejections is respectfully requested.

3. The Office Action rejected claims 42, 43, 76 and 77 under 35 U.S.C. 103(a) as being unpatentable over Dalal and Takebe as applied to claims 36 and 70 and further in combination of Somaki et al. (US-5,641,113, hereinafter Somaki).

Applicants respectfully disagree and would like to point out that even though the Office Action relied upon Somaki to disclose a transition material between the said a cylindrical conductive material and a conductive solder cap, still Somaki cannot cure the specific deficiencies of Dalal and Takebe.

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For at least the forgoing reason, claims 42, 43, 76 and 77 patently define over prior art of record. Reconsideration and withdrawal of these rejections is respectfully requested.

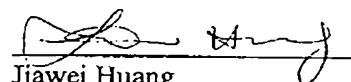
CONCLUSION

For at least the foregoing reasons, it is believed that all pending claims 36-38, 41-42, 70-72 and 75-84 are in proper condition for allowance. If the Examiner believes that a conference would be of value in expediting the prosecution of this application, he is cordially invited to telephone the undersigned counsel to arrange for such a conference.

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